NETL Regional Workforce Initiative (NETL RWFI)

NATIONAL ENERGY TECHNOLOGY LABORATORY

U.S. DEPARTMENT OF ENERGY

NETL RWFI Mission Statement

NETL RWFI is a platform for engagement and collaboration with key stakeholders who are critical for the deployment of U.S. DOE and NETL Energy and Advanced Manufacturing technological research.

Supporting Regional Economic and Workforce Development opportunities.

NETL RWFI- Measuring Our Impact - People First

Key Metrics are Levels of Engagement and Outreach

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800+
individual stakeholders

400+
institutions and organizations represented

2000+
registrants to the NETL RWFI Webinar Series

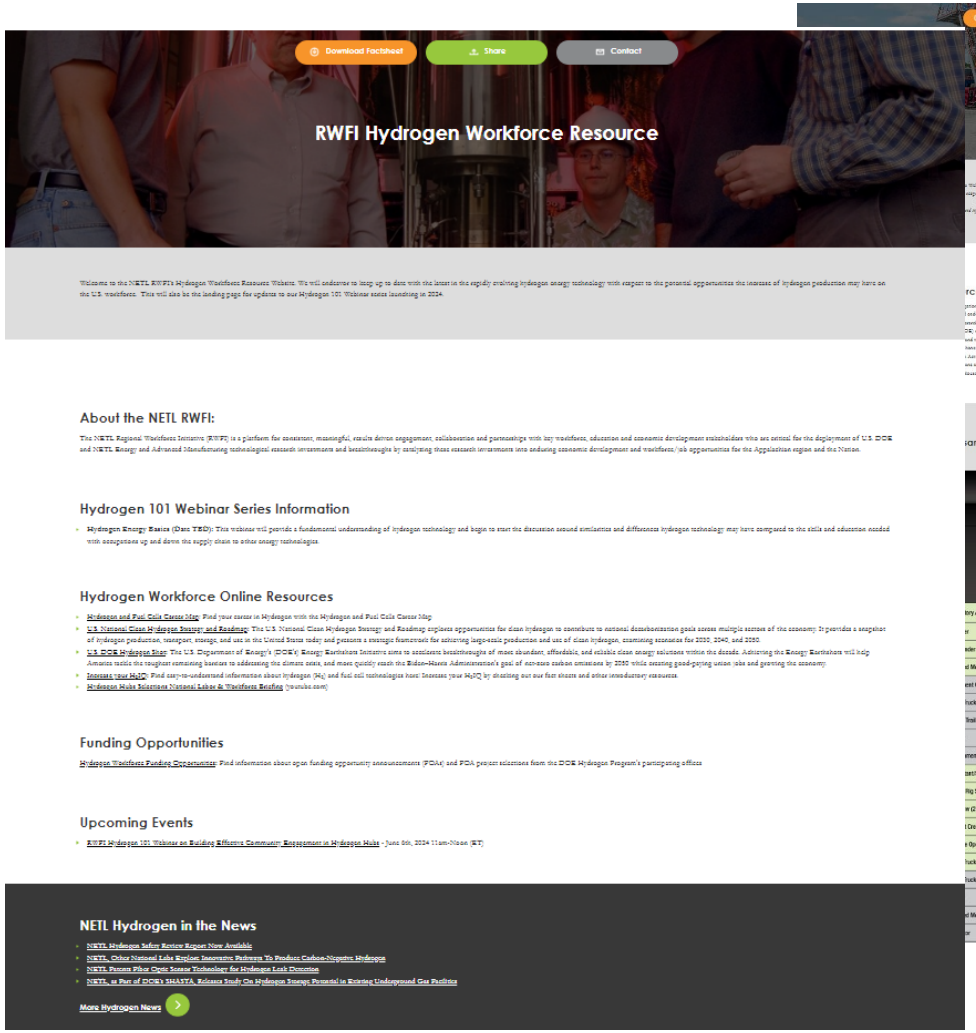
300+
subscribed to the NETL RWFI e-Note Monthly Newsletter

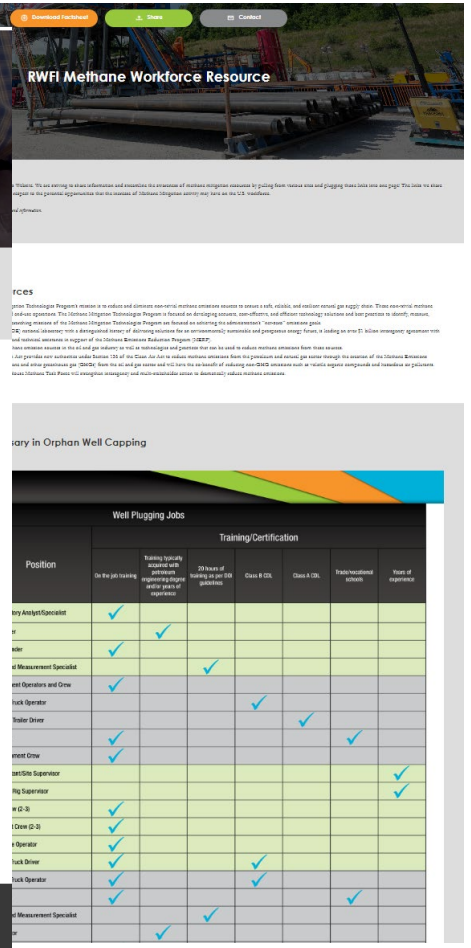
Catalyzed over 2M in energy/advanced manufacturing workforce & economic development funding

NETL Regional Workforce Initiative Updates

Supporting Regional Economic and Workforce Development opportunities.

- **NETL RWFI, DOE IEDO Industrial Sustainability, Energy Efficiency and Decarbonization (ISEED) Workforce Collaborative** (FY24to FY26)- Working with NREL and ORNL to help establish an Industrial Efficiency Workforce Collaborative for DOE IEDO. Will endeavor to engage the PA, OH, WV and greater Appalachia through our efforts in this program.
- **DOE TCF- MSI Connect Program with Brookhaven National Lab (FY 2023-24) Appx 30K-** Awarded a TCF to improve MSI engagement with labs (BNL, LLNL, SNL, PPPL, SLAC). NETL will host 6 students from MSI universities to work on Carbon Management IP commercialization
- **NSF Engines Planning Grant Pitt/WVU/CMU-** Together with WVU, UPItt, and other regional organizations, NETL RWFI is part of this 1M NSF planning grant intended as a precursor step to applying for the larger 100M NSF Engines grant. The NSF Regional Innovation Engines program, designed to support the development of diverse regional coalitions to create innovation-driven solutions with economic and societal impact.
- **NETL RWFI Hydrogen and Methane Mitigation Workforce Activities:** NETL RWFI launched a H2 Workforce website for regional stakeholders as well as a Methane Mitigation Workforce website. NETL RWFI will launch similar workforce resources for carbon mitigation technologies and serve as a web portal for regional stakeholders to learn more about skills, reports, analysis and funding available for workforce activities.



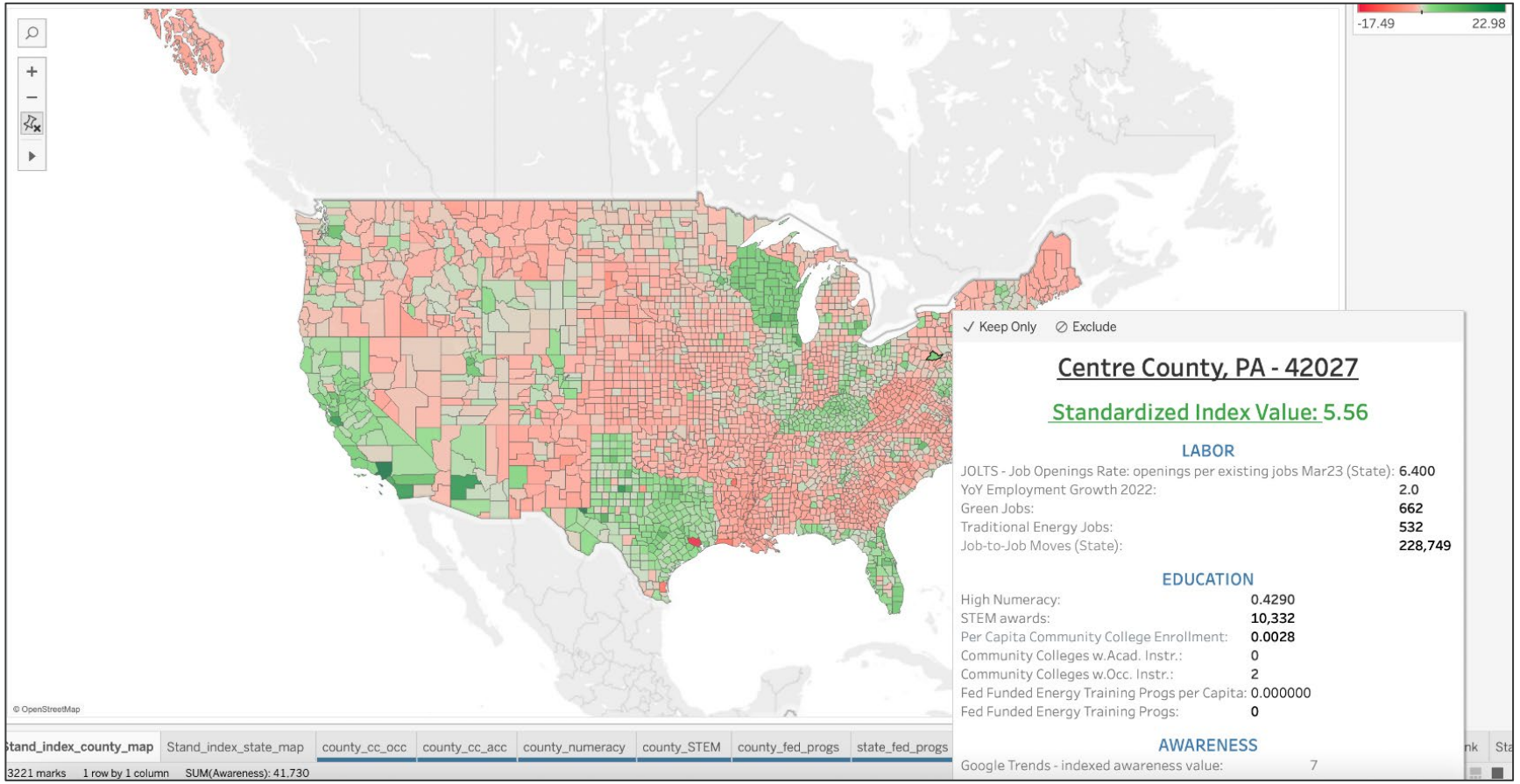


Hydrogen Workforce: Data Driven, Engagement, Community Sentiment and Awareness, Workforce Readiness, Skills Taxonomy/Ontology

- **Community Stakeholder Engagement and Regional/National Workforce Activities: Aggregation/Integration/Communication/Deployment (NETL RWFI)**
  - Regional and national outreach (Leverage RWFI network)
  - **Hydrogen 101 Series (Hydrogen tech basics/workforce impacts/research impacts and roadmaps)**
  - Hydrogen focus group (Education and Workforce) (best practice sharing—catalyzing follow-on funding, stakeholder awareness)
  - Workforce Readiness and Workforce Awareness Regional and National Index
  - Skills Taxonomy and Skills Matching
  - Regional Hydrogen workforce playbooks (Australia Hydrogen Workforce Industry Roadmap Strategic Plan, Victoria Hub Hydrogen Workforce DOE roadmap)/dashboard hosting
  - **Answer the what, when, and where of Hydrogen Workforce**
- **Dashboard Tracker of Workforce Impacts**
  - Impacts and analysis integration and tracking through an online/real time dashboard
  - Potential future work with integration with LLM for occupation discovery and worker outreach/education on hydrogen skills/current occupation and skills match
  - LLM Virtual guidance counselor
  - Dynamic real time reporting on national hydrogen strategy goals progress

Skills Mapping and Jobs and Skills Projection for U.S. Hydrogen Industries (Julius Education)

Current Green Workforce Readiness Dashboard



- They have integrated 25+ relevant data sets to evaluate county-level readiness for green workforce development.
- Data spans educational indicators, labor market conditions, and analysis of awareness of jobs and career pathways.
- This work could be localized and contextualized to the opportunities and challenges in building the requisite Hydrogen workforce.

Example of a Potential Hydrogen Skills Taxonomy: Opportunity to Provide Deep Skills Analysis and Enable Skill Transferability

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Hydrogen Plant Machinery Operator Skills Model (Example)

Rich Skill (tied to role)	Generic Skill
Monitor equipment for safety and performance	equipment monitoring
Operate valves and pumps to control the flow of hydrogen	valve/pump operation
Adjust machinery to maintain the desired pressure and temperature	machinery adjustment
Troubleshoot and repair any malfunctions or breakdowns	troubleshoot
Inspect and maintain equipment to ensure compliance with safety regulations	equipment inspection
Perform routine maintenance to keep machinery in optimal condition	maintenance technician
Monitor hydrogen levels and adjust as needed	hydrogen monitoring
Load and unload materials for processing	material handling
Follow established safety protocols	safety protocols
Document all work performed and test results	documentation testing
Observe safety precautions when handling hazardous materials	safety handling
Coordinate with other personnel to ensure efficient operation	coordinating
Analyze data and make adjustments to ensure optimal performance	data analysis
Operate computer systems to monitor and control machinery	computer systems operations
Respond to alarms and take corrective action	alarm response
Prepare reports to document operations and maintenance activities	report preparation
Perform tests on samples to measure hydrogen levels	testing hydrogen
Follow instructions from supervisors to ensure proper operation	following instructions
Train other personnel in the operation of hydrogen plant machinery	training others
Adjust settings on machinery to optimize performance	machine tuning
Identify and report any defects or malfunctions	troubleshoot
Monitor and adjust hydrogen levels as required	hydrogen monitoring
Assemble, install and maintain machinery	machinery maintenance
Calibrate instruments to ensure accuracy	calibration
Troubleshoot and repair any issues with machinery	machinery repair
Maintain records of hydrogen production and consumption	hydrogen tracking
Perform quality checks on products and materials	quality control
Follow safety guidelines when handling hazardous materials	safety handling
Analyze data to identify trends and potential problems	data analysis

- Having a skills taxonomy and ontology provides a critical enabler of a whole host of workforce use cases to support recruiting, employee retention, workforce and academic program development, and upskilling.
- It also helps match potential employees to the right job, clarifies skills “delta” between where a job seeker or employee is today and the job they aspire to, illuminates skill transferability between jobs with similar skills, and helps educators develop more employer aligned programs, among many other benefits.
- They use AI tools to automate the development and maintenance of a Hydrogen Skills Taxonomy.

BLS Occupational Skills Profile Data Analysis Across Geographic Location of Energy Labor Activity (U. Pitt.)

Location is a major barrier for transferring U.S. fossil fuel employment to green jobs
(Nature Communications; 26, Sept. 2023)

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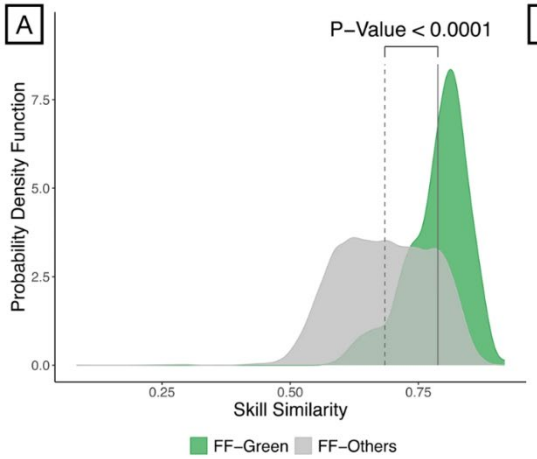

B

Dependent Variable: $Transition_{f,m,i',m'}$					
	Model 1	Model 2	Model 3	Model 4	Model 5
Skill Similarity$_{i,i'}$		0.59 (0.0001) $P \leq 10^{-3}$		0.84 (0.0001) $P \leq 10^{-3}$	0.41 (0.0003) $P \leq 10^{-3}$
Distance$_{m,m'}$			-1.13 (0.0001) $P \leq 10^{-3}$	-1.18 (0.0001) $P \leq 10^{-3}$	-2.07 (0.0003) $P \leq 10^{-3}$
Employment$_{f,m}$	0.94 (0.0002) $P \leq 10^{-3}$	0.97 (0.0002) $P \leq 10^{-3}$	1.01 (0.0002) $P \leq 10^{-3}$	1.00 (0.0002) $P \leq 10^{-3}$	1.04 (0.0002) $P \leq 10^{-3}$
Employment$_{i',m'}$	0.85 (0.0002) $P \leq 10^{-3}$	0.90 (0.0002) $P \leq 10^{-3}$	0.98 (0.0002) $P \leq 10^{-3}$	0.97 (0.0002) $P \leq 10^{-3}$	1.04 (0.0002) $P \leq 10^{-3}$
Stay (Industry)					1.11 (0.0006) $P \leq 10^{-3}$
Stay (Location)					-3.43 (0.0012) $P \leq 10^{-3}$
Constant	1.16 (0.0002) $P \leq 10^{-3}$	0.95 (0.0003) $P \leq 10^{-3}$	0.23 (0.0003) $P \leq 10^{-3}$	-0.04 (0.0003) $P \leq 10^{-3}$	-0.34 (0.0003) $P \leq 10^{-3}$
Pseudo R^2	0.16	0.21	0.72	0.81	0.84
Observations	10,352,319	10,352,319	10,352,319	10,352,319	10,352,319

High skills similarity between FE and other EE/RE industry skills
*(North American Industry Classification System two digit/ O*Net)*

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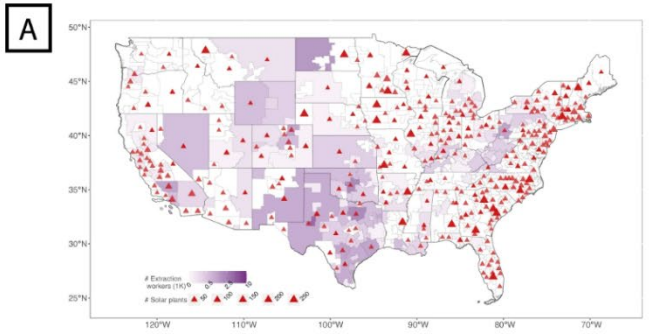

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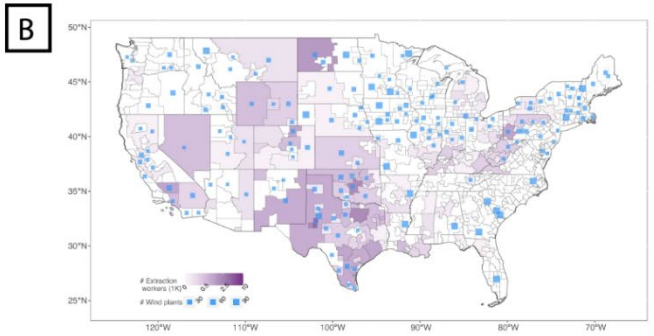

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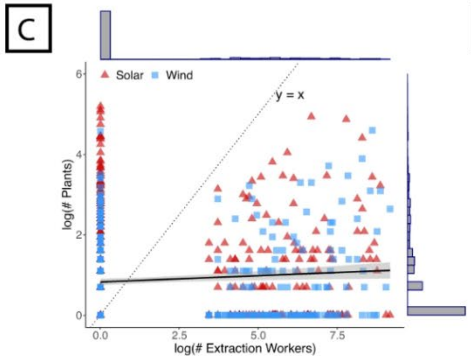
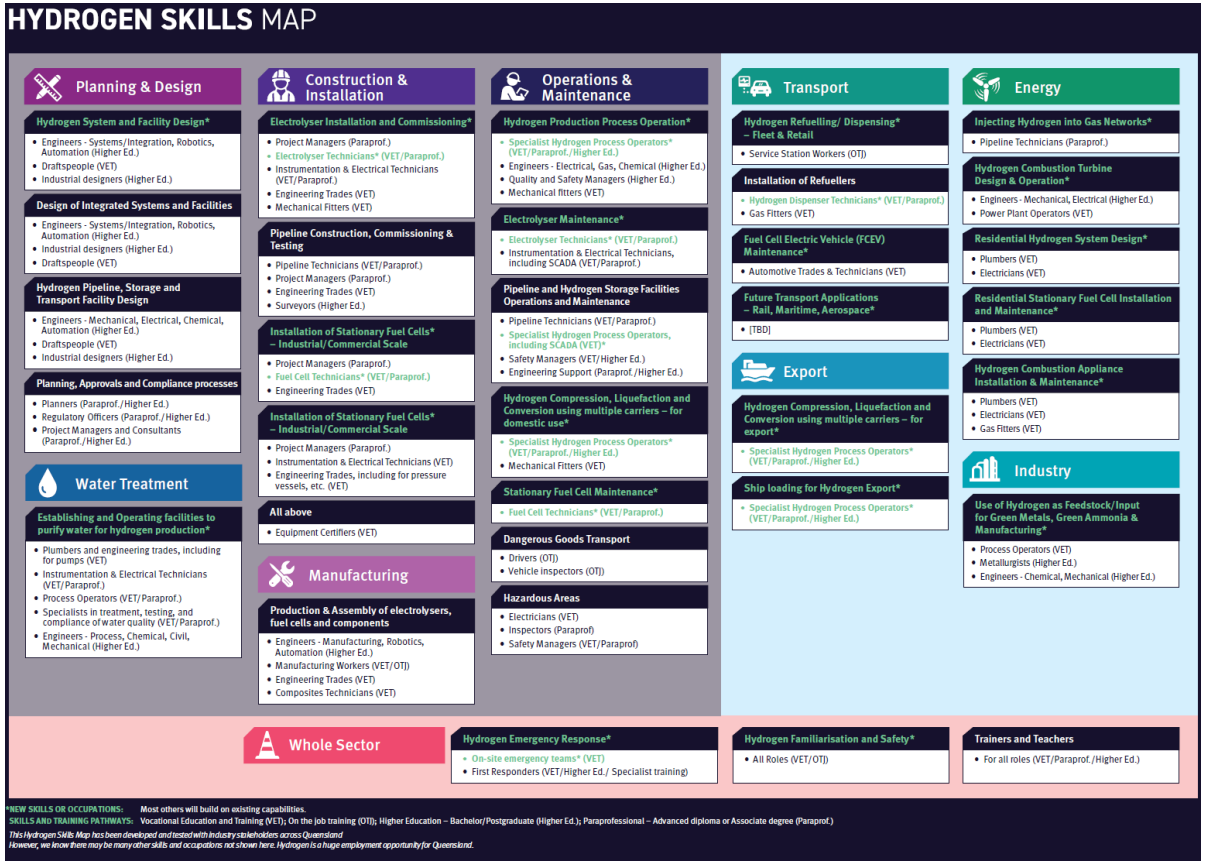


D

	All Plants		Solar Plants		Wind Plants	
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
log(Extraction Workers)	-0.01 (0.004) P=0.151		-0.06 (0.01) $P \leq 10^{-3}$		0.18 (0.01) $P \leq 10^{-3}$	
log(FF Workers)		-0.02 (0.01) $P \leq 10^{-3}$		-0.12 (0.01) $P \leq 10^{-3}$		0.19 (0.01) $P \leq 10^{-3}$
log(Labor Force)	0.51 (0.01) $P \leq 10^{-3}$	0.52 (0.01) $P \leq 10^{-3}$	0.70 (0.01) $P \leq 10^{-3}$	0.80 (0.01) $P \leq 10^{-3}$	-0.01 (0.03) P=0.853	-0.06 (0.03) P=0.034
Psuedo R^2	0.26	0.26	0.33	0.35	0.09	0.06
Observations	510	510	510	510	510	510

EE/RE energy production with very little co-localization with FE worker

Skills Mapping and Jobs and Skills Projection for U.S. Hydrogen Industries (Workforce roadmaps)



Australia Hydrogen Workforce Industry Roadmap
Victorian Hydrogen Workforce Report/Roadmap

Future jobs and skills trajectory

Combining the analysis and modelling of the future green hydrogen economy, the emergence of jobs being impacted by green hydrogen-related changes over the coming decades is predicted in the figure below.

As the industry rapidly evolves, these predictions are subjected to change. The introduction of new technologies, implementation of new regulations and adoption of hydrogen to scale is expected to result in jobs needing to be filled earlier than anticipated.

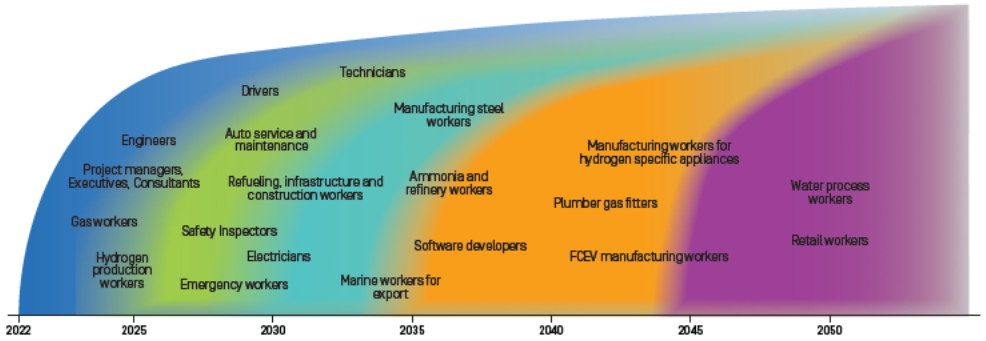


Figure 12. Predicted emerging jobs in various industries driven by green hydro

Contact Information

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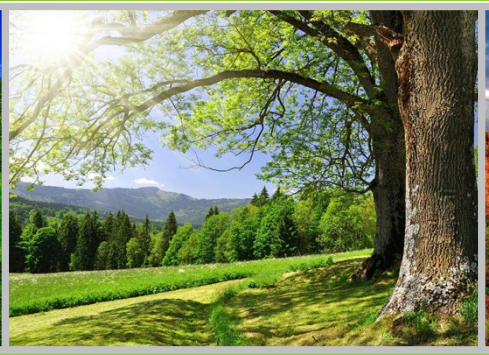
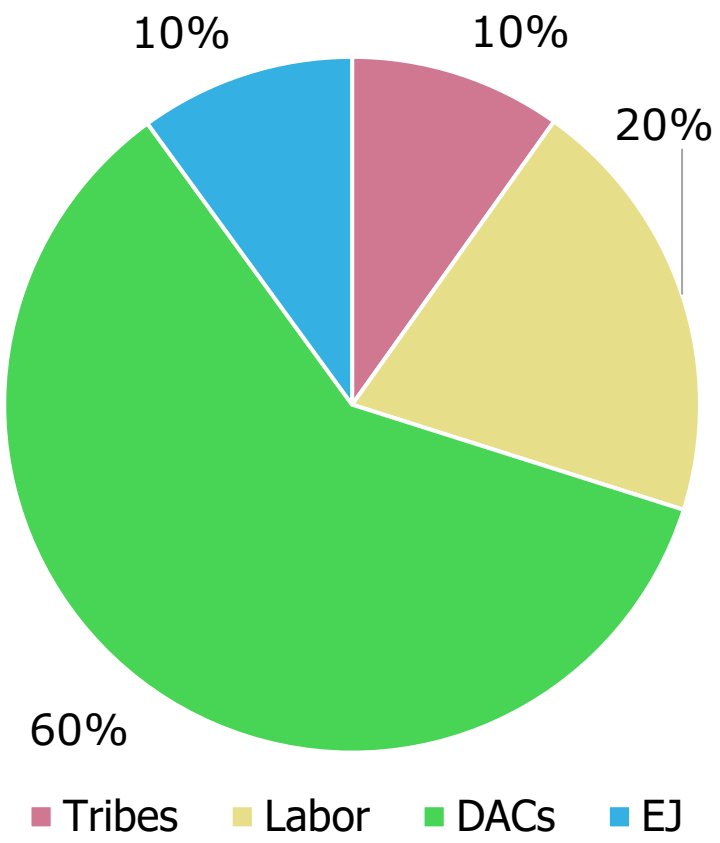
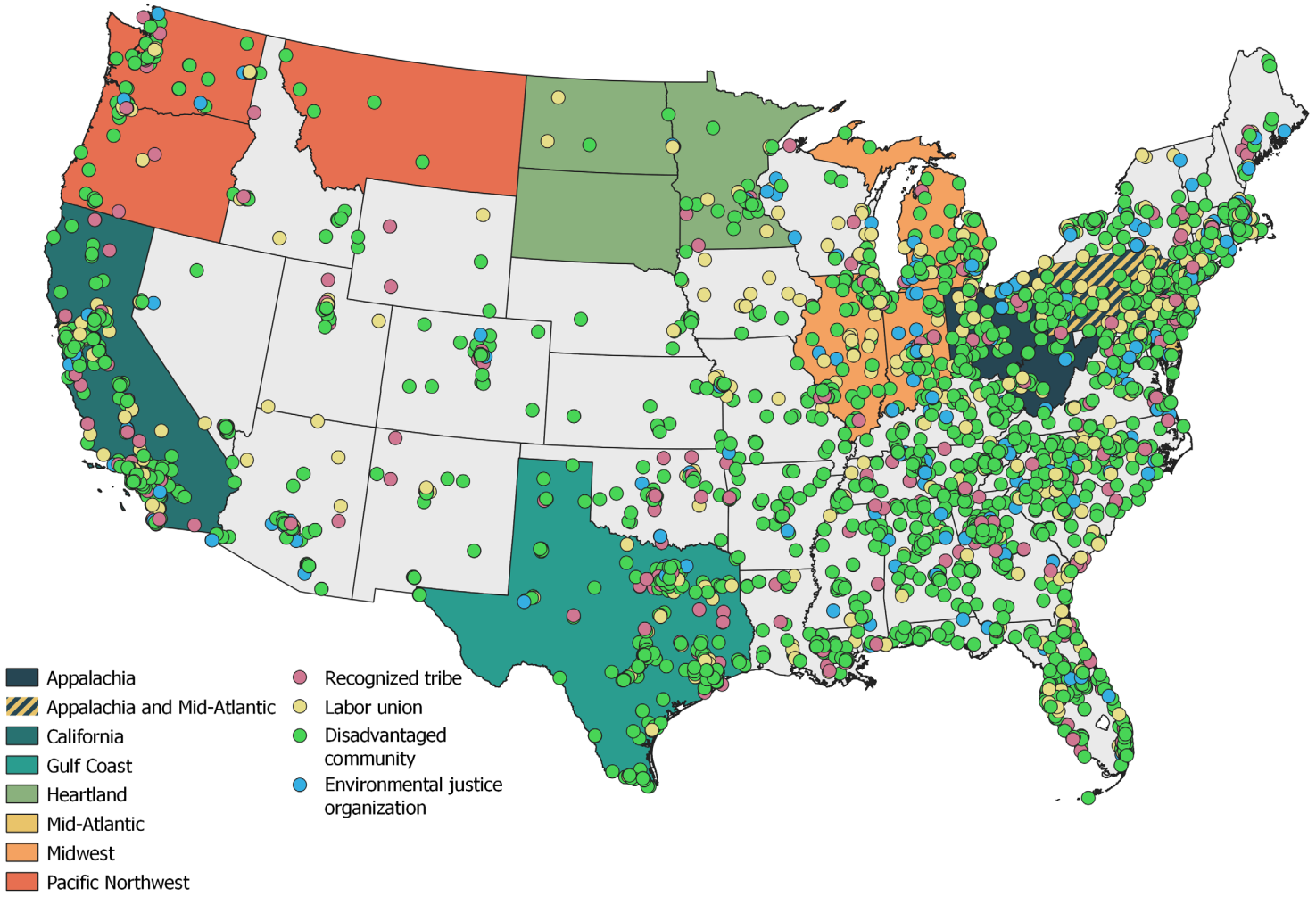


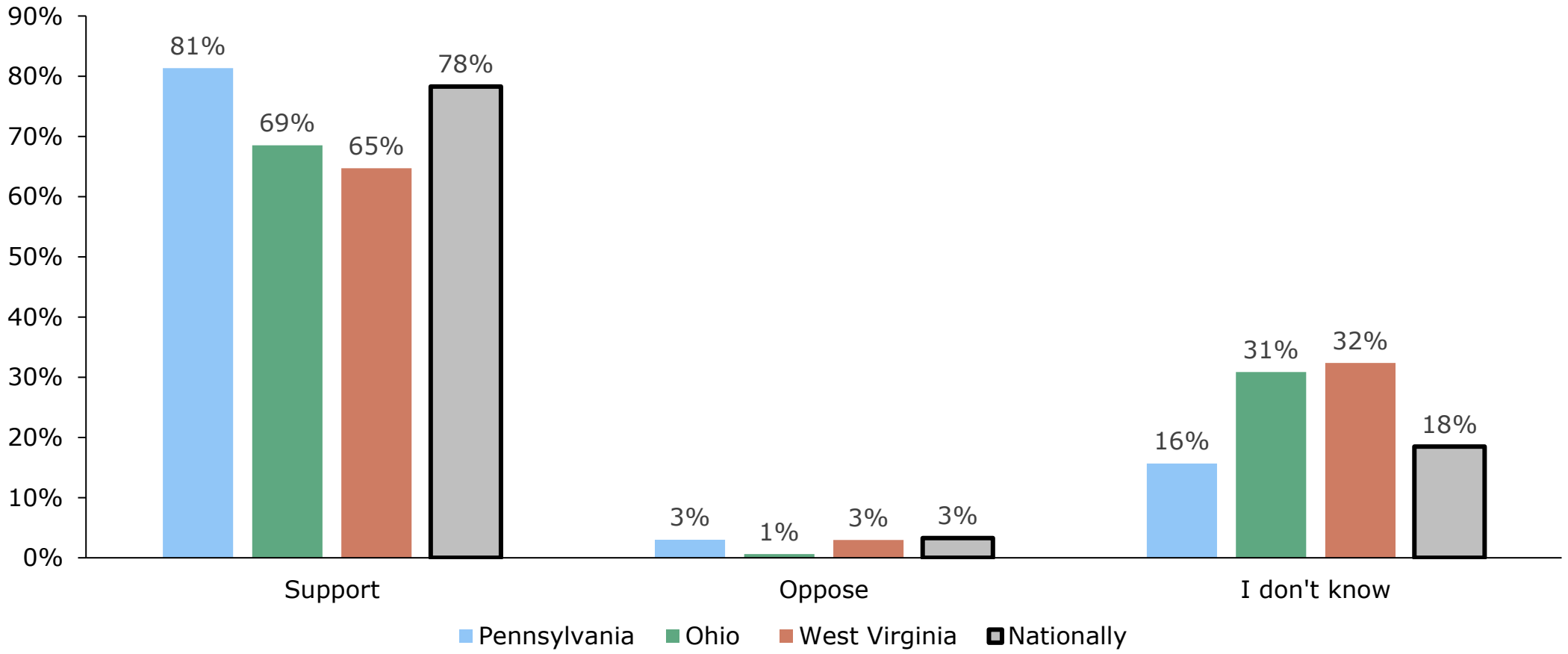
Community Perspectives on Hydrogen Hubs: Regional Findings from EFIF's National Surveys

~5,000 survey respondents cover a range of communities and geographies.

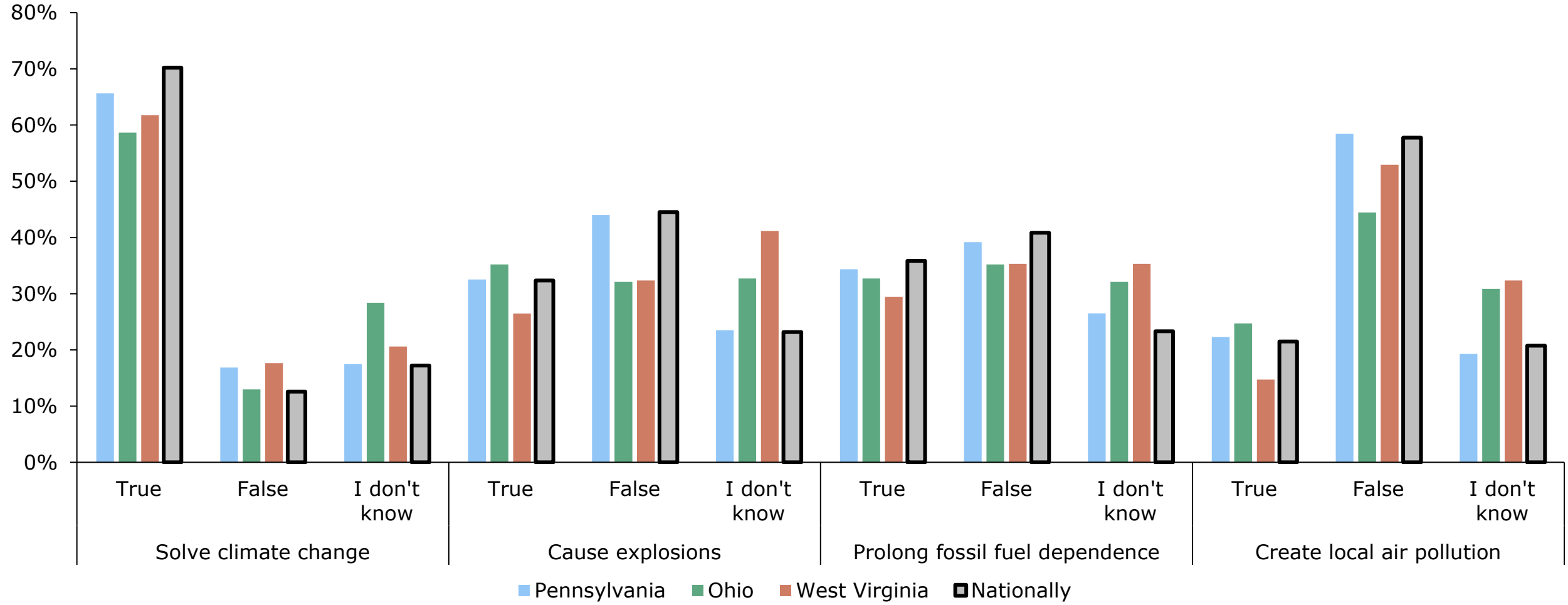




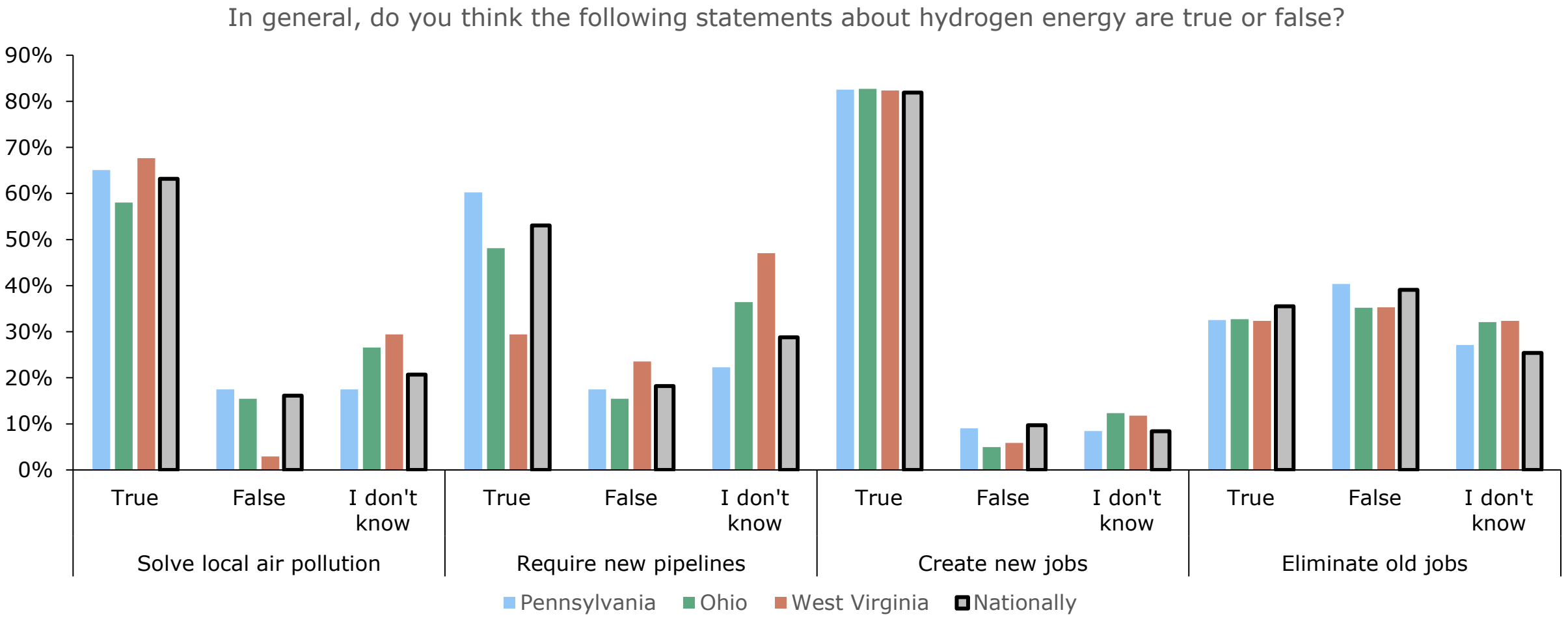
West Virginians and Ohioans reported lower levels of support than the national average.



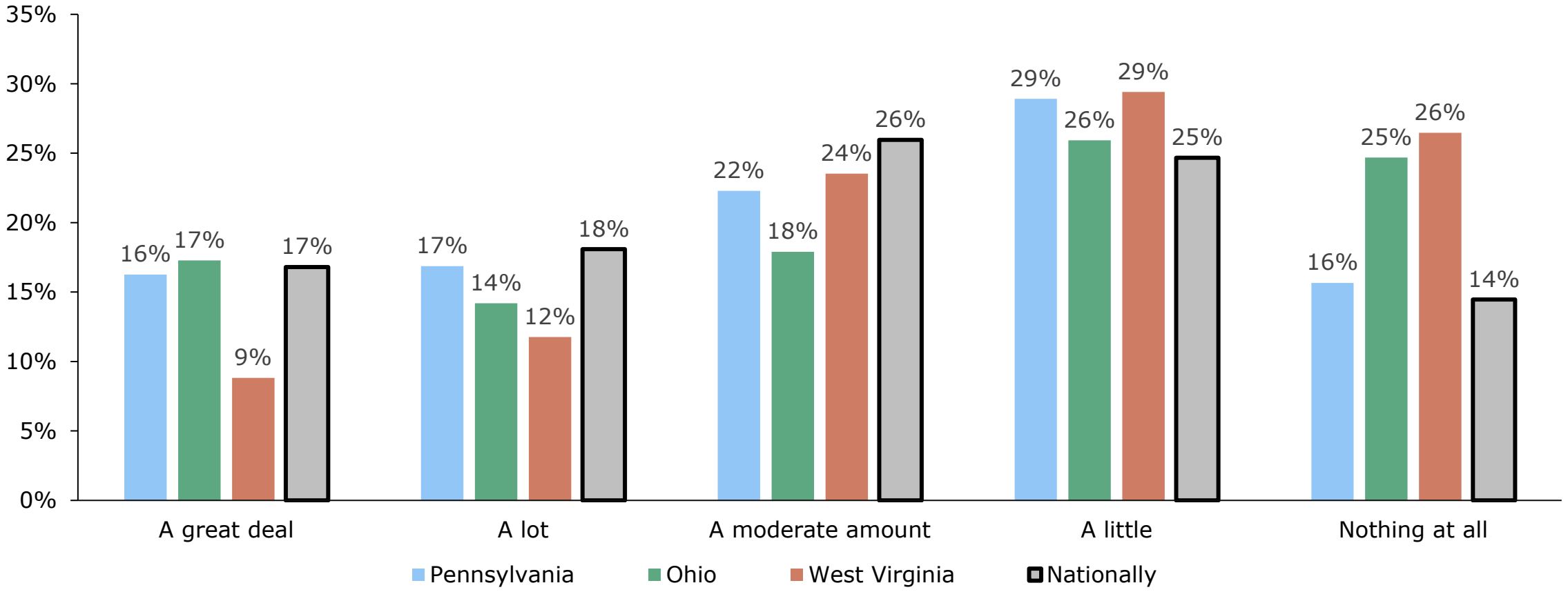
West Virginians and Ohioans were more likely to be unsure if hydrogen would solve climate change, cause explosions, prolong fossil fuels, and create pollution.



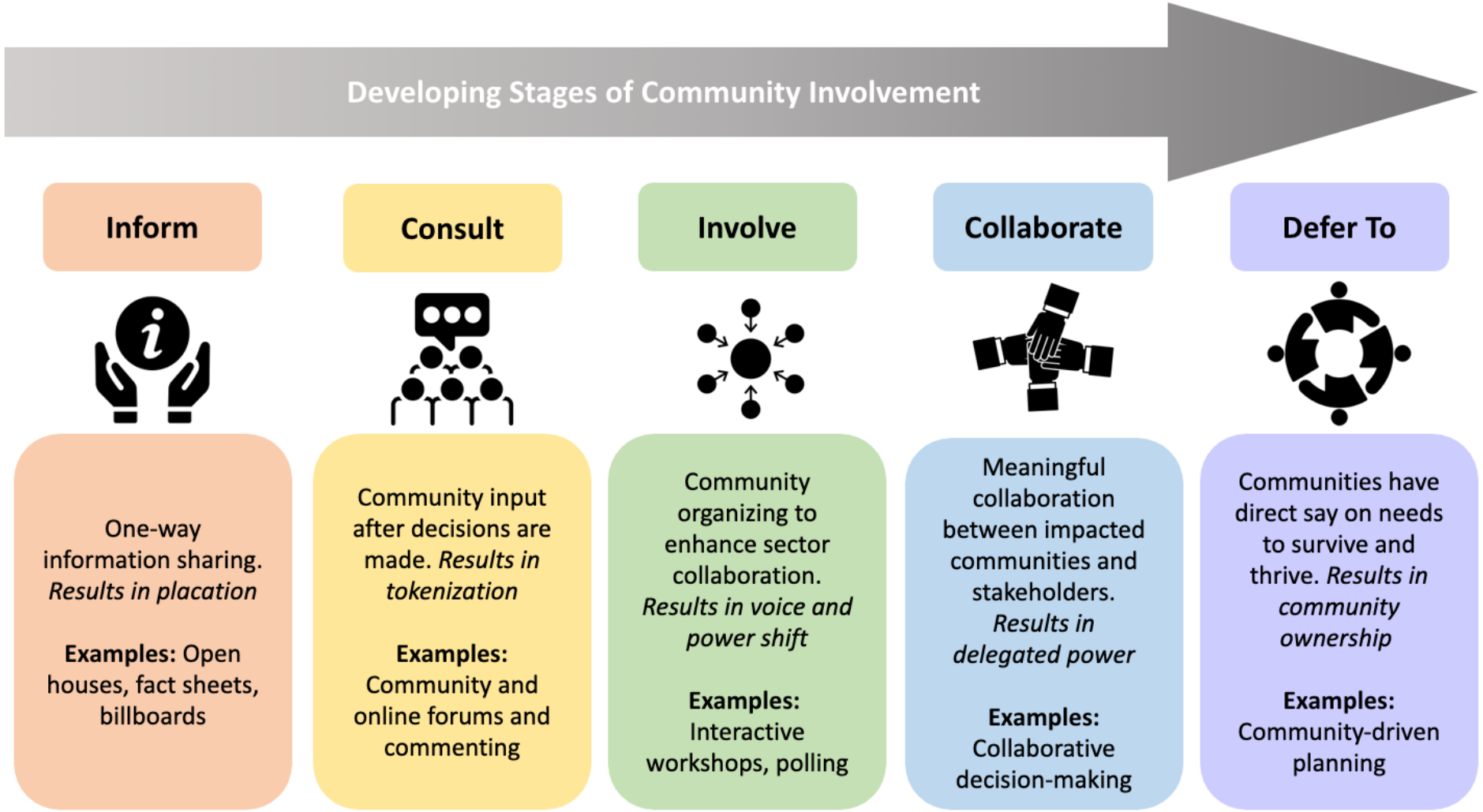
West Virginia and Ohio respondents were more unsure of whether hydrogen would require new pipelines, solve local air pollution, create new jobs, and eliminate old jobs.



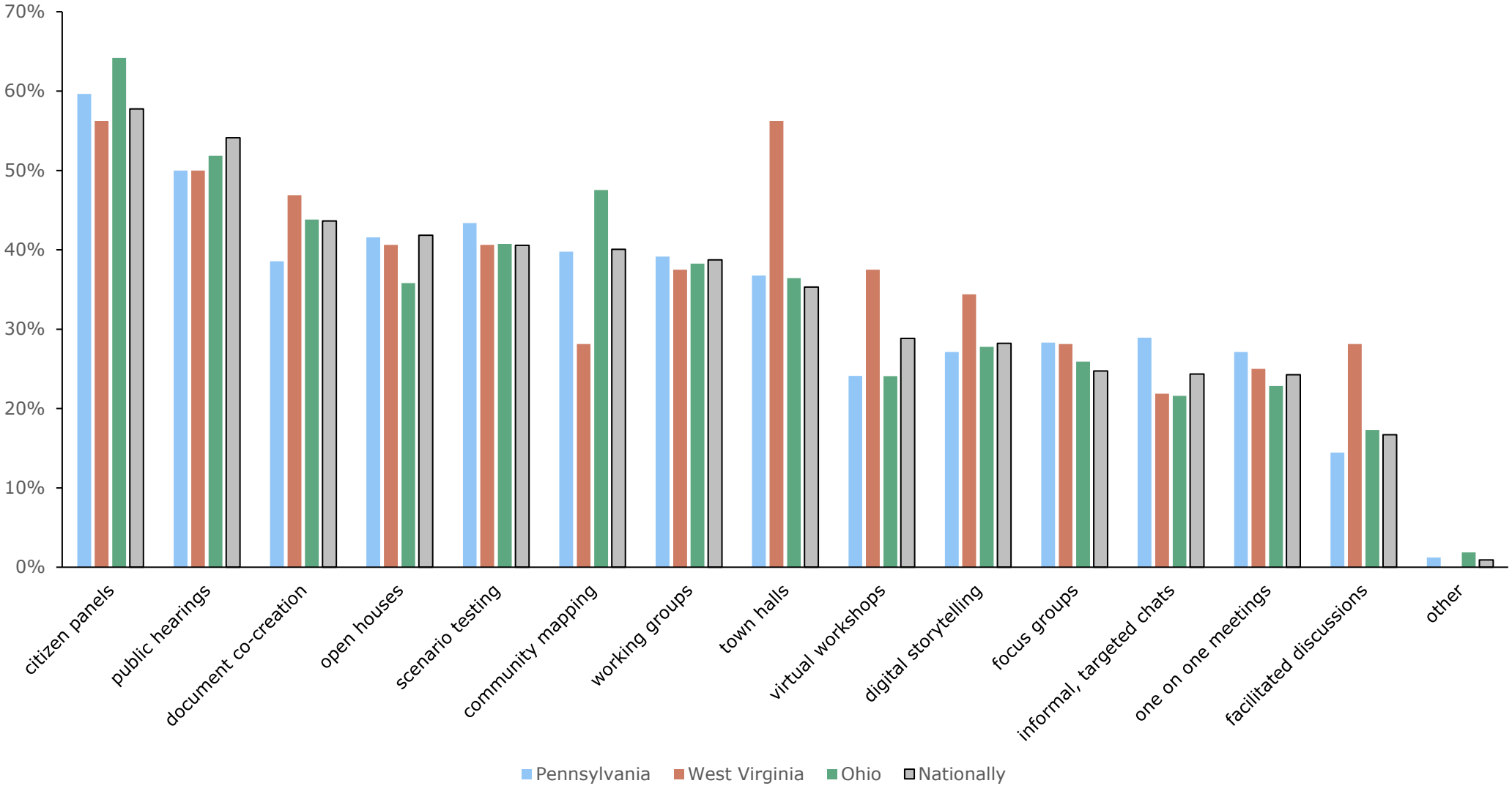
West Virginians reported knowing less about hydrogen than Pennsylvanians or Ohioans.



Community engagement methods fall along a spectrum, depending on the level of input from communities.

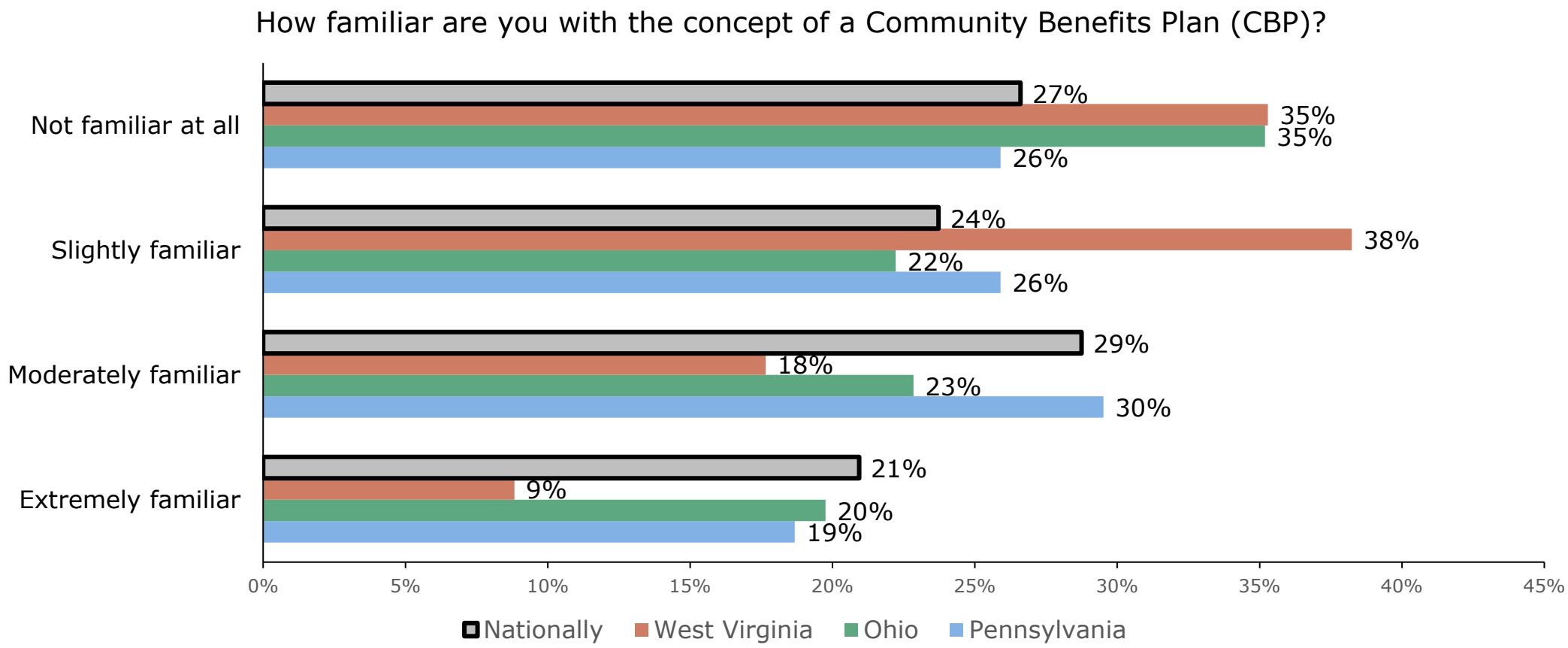


Preferred engagement methods vary by state.

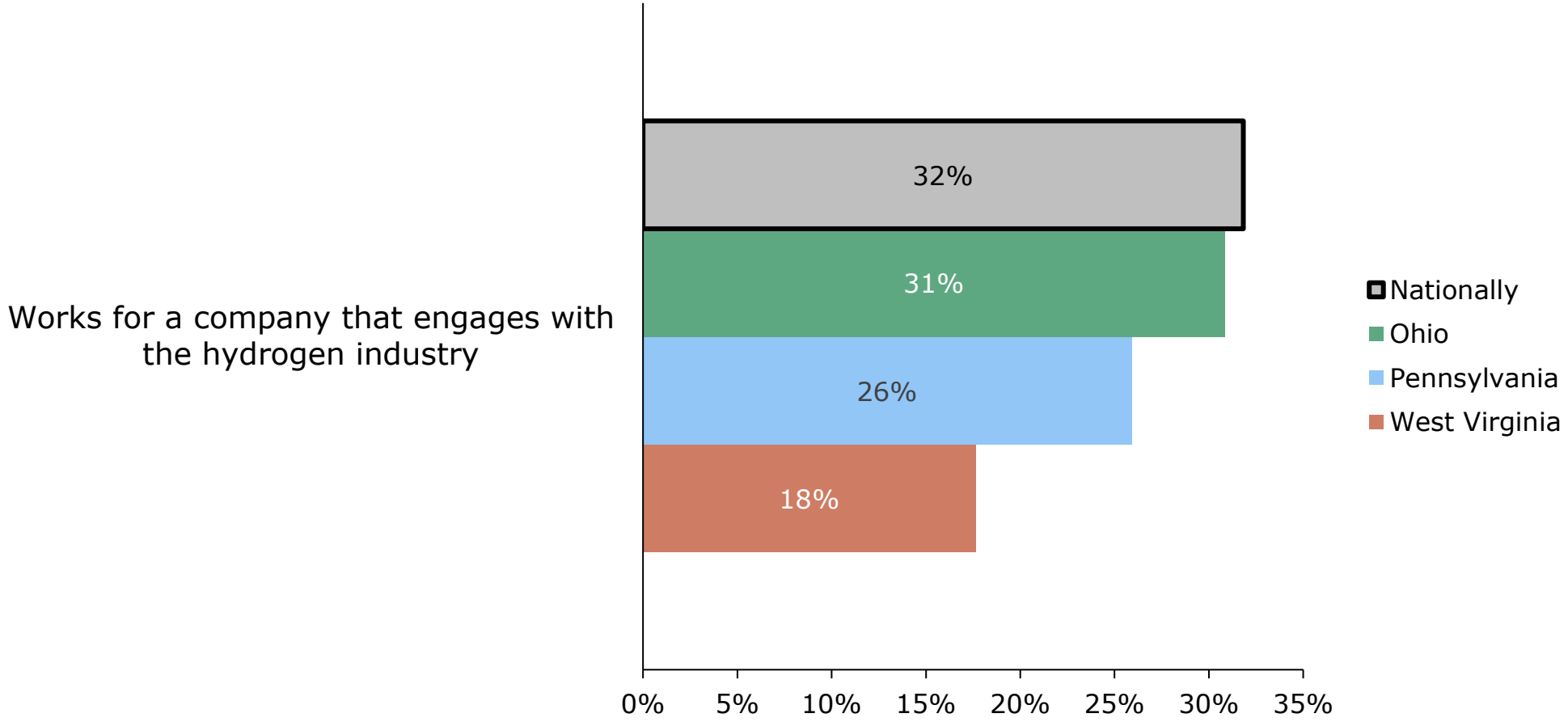


Scenario testing joins the top 3 for PA; community mapping for OH; and town halls were top choice for WV.

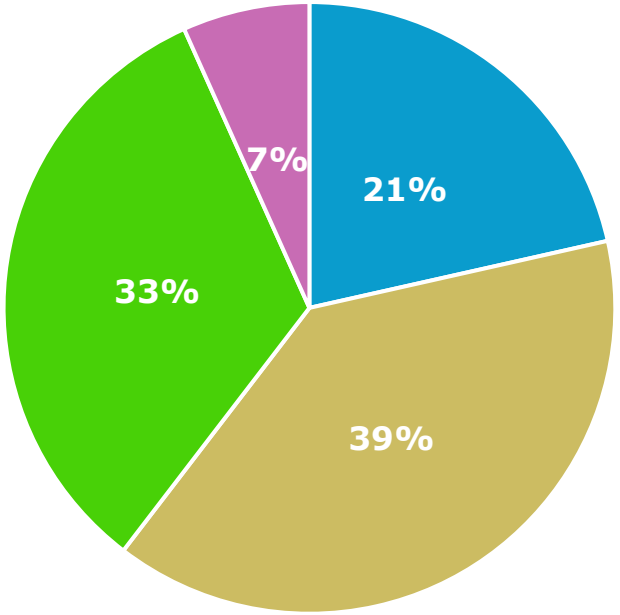
West Virginians knew the least about CBPs, while Pennsylvanians were most closely aligned with the national average.



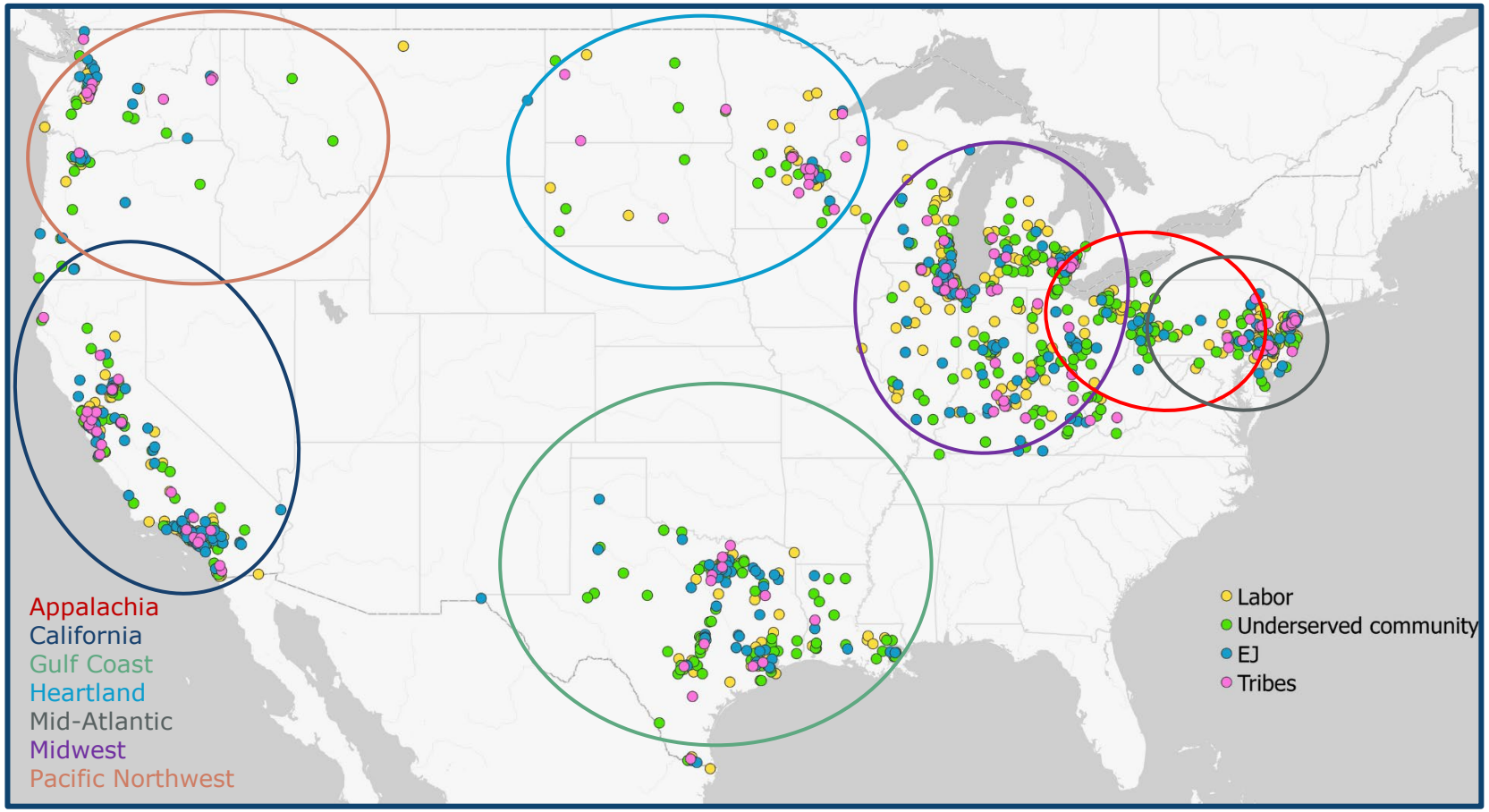
Respondents from West Virginia and Pennsylvania reported lower levels of employment in hydrogen-adjacent industries.



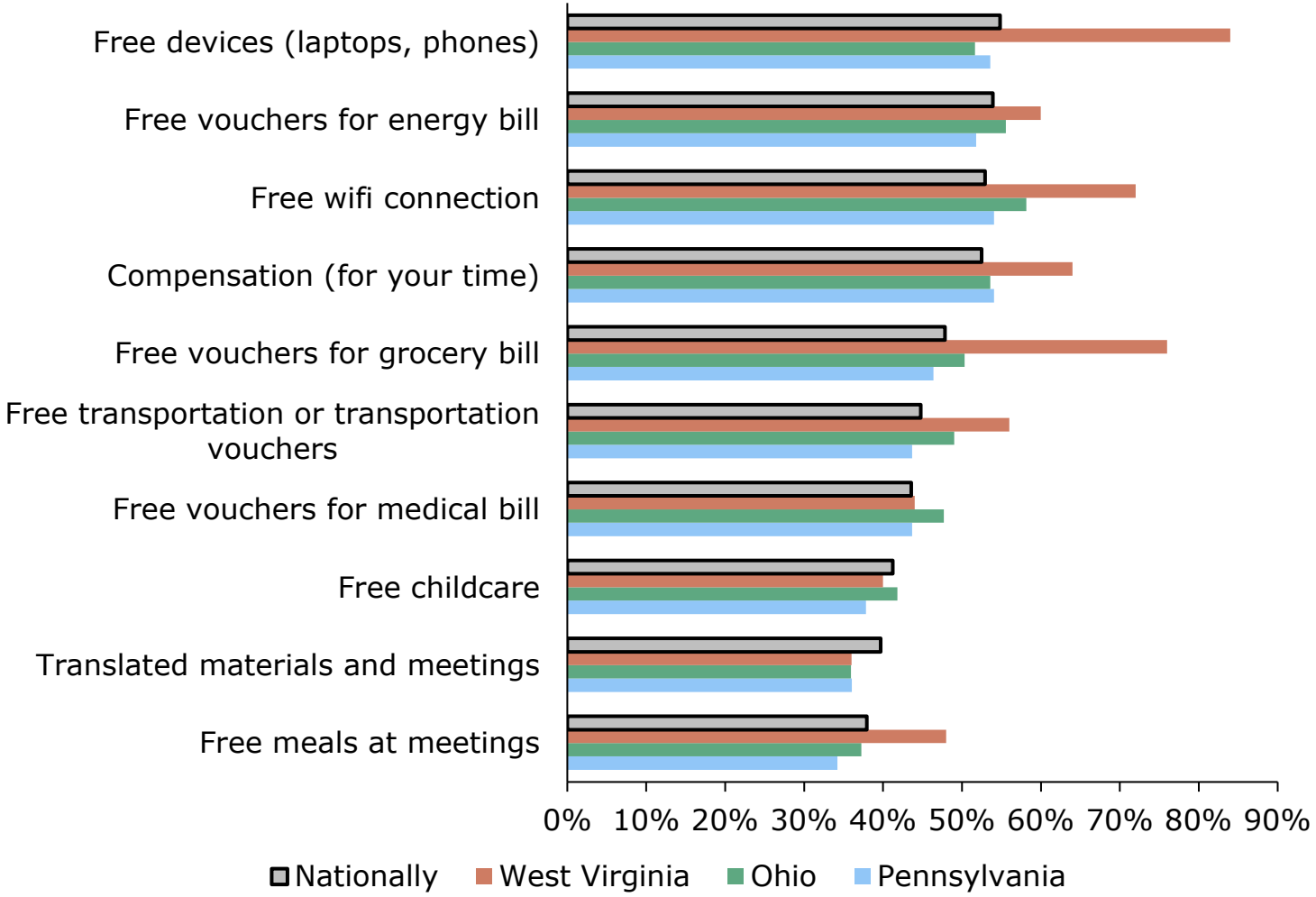
~3000 survey respondents covering a range of communities and geographies.



- Environmental justice organization
- Labor group
- Underserved community
- Recognized Tribe



Pennsylvanians, West Virginians, and Ohians have unique needs for engagement.

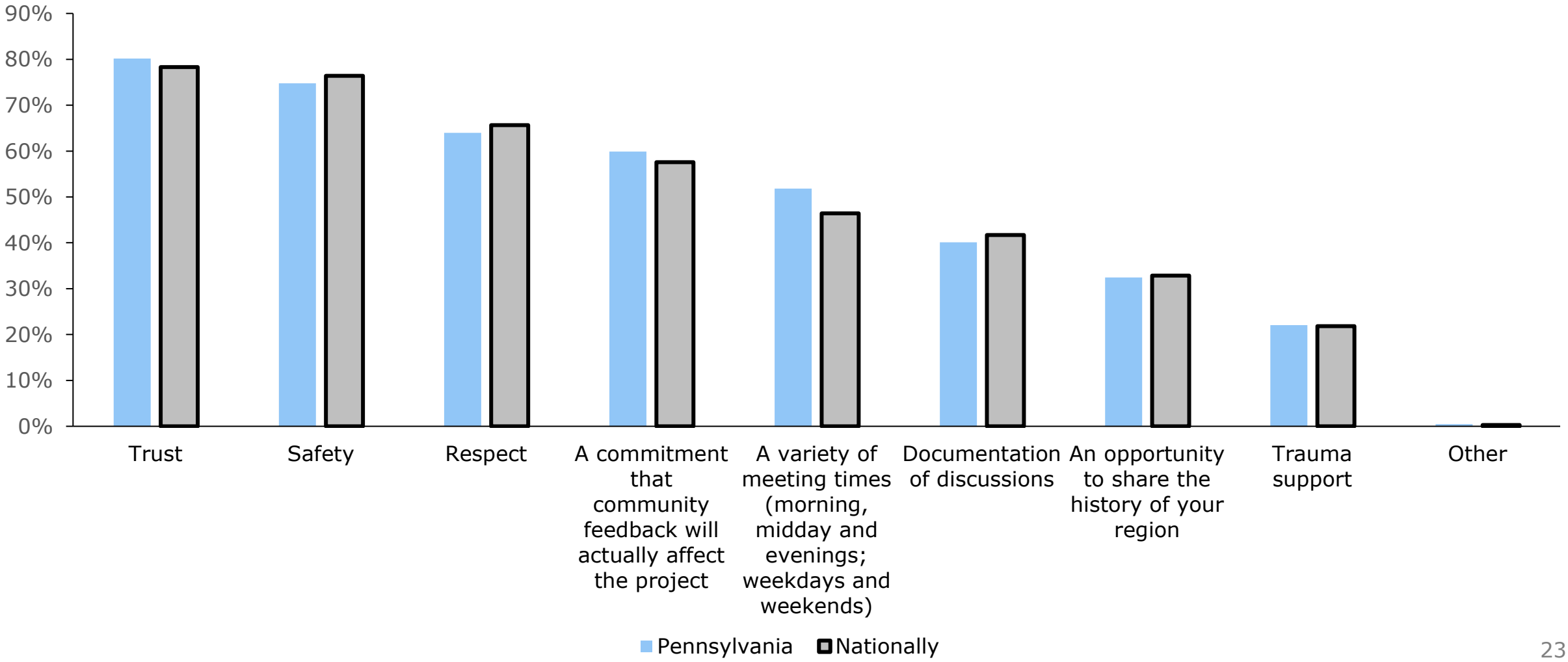


Pennsylvanians say free wifi connection and compensation will help them engage.

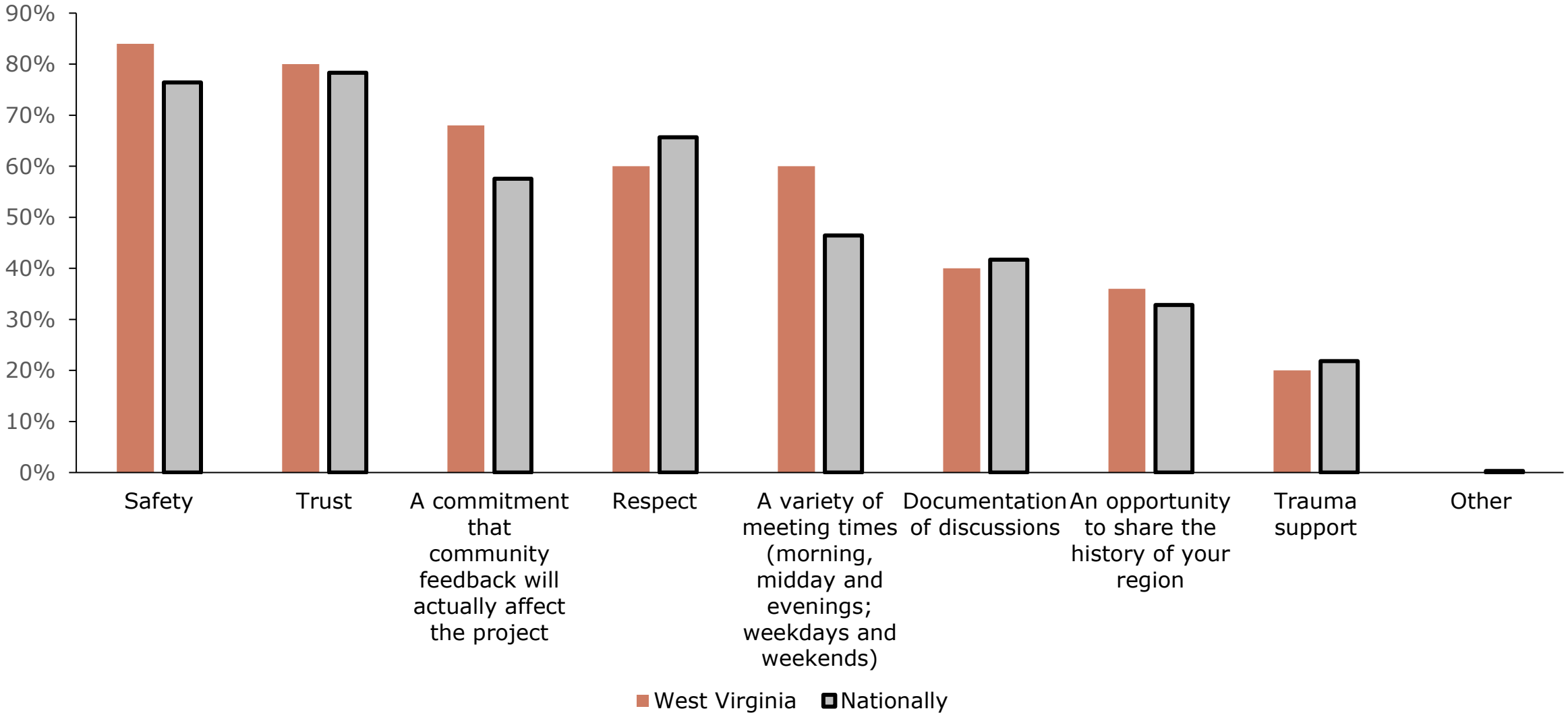
West Virginians say free devices and grocery vouchers will help them engage.

Ohioans say free wifi connection and energy bill vouchers will help them engage.

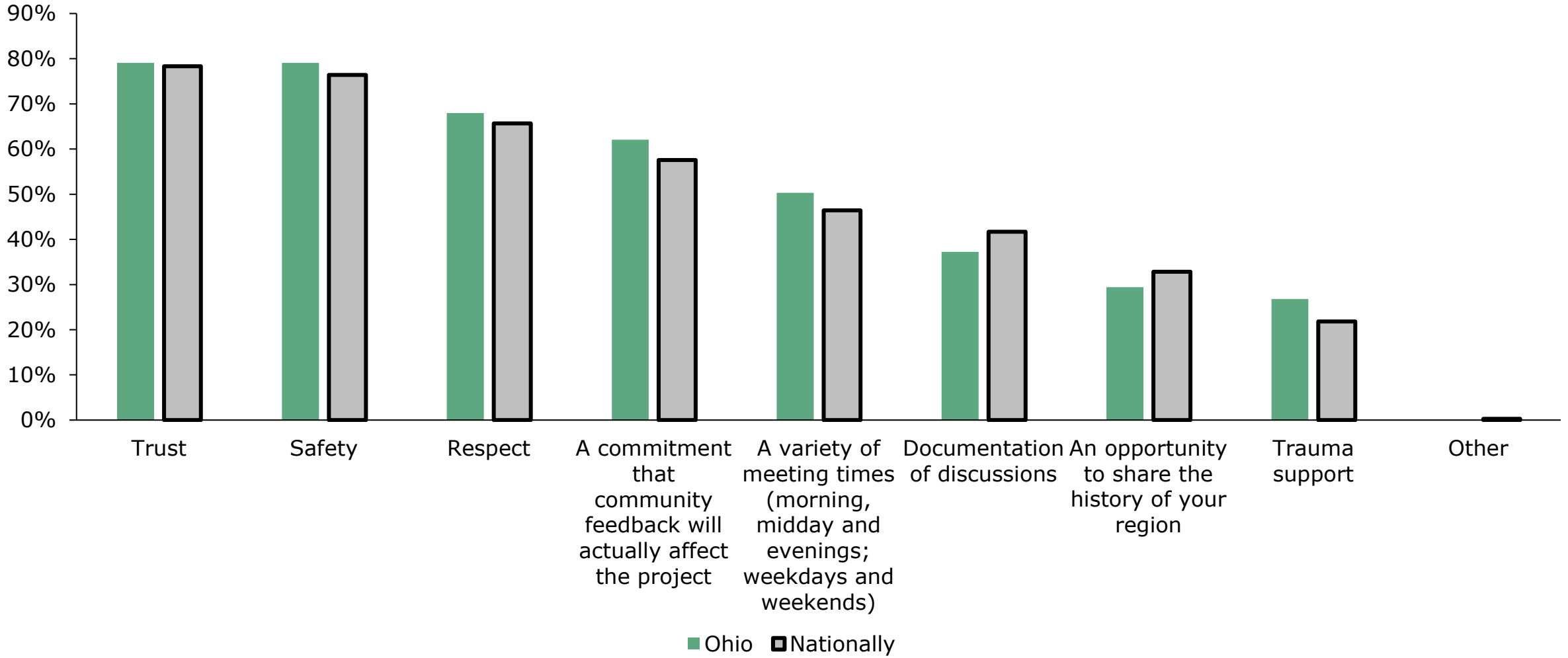
Pennsylvanians say trust and safety will help them engage, consistent with the nation writ large.



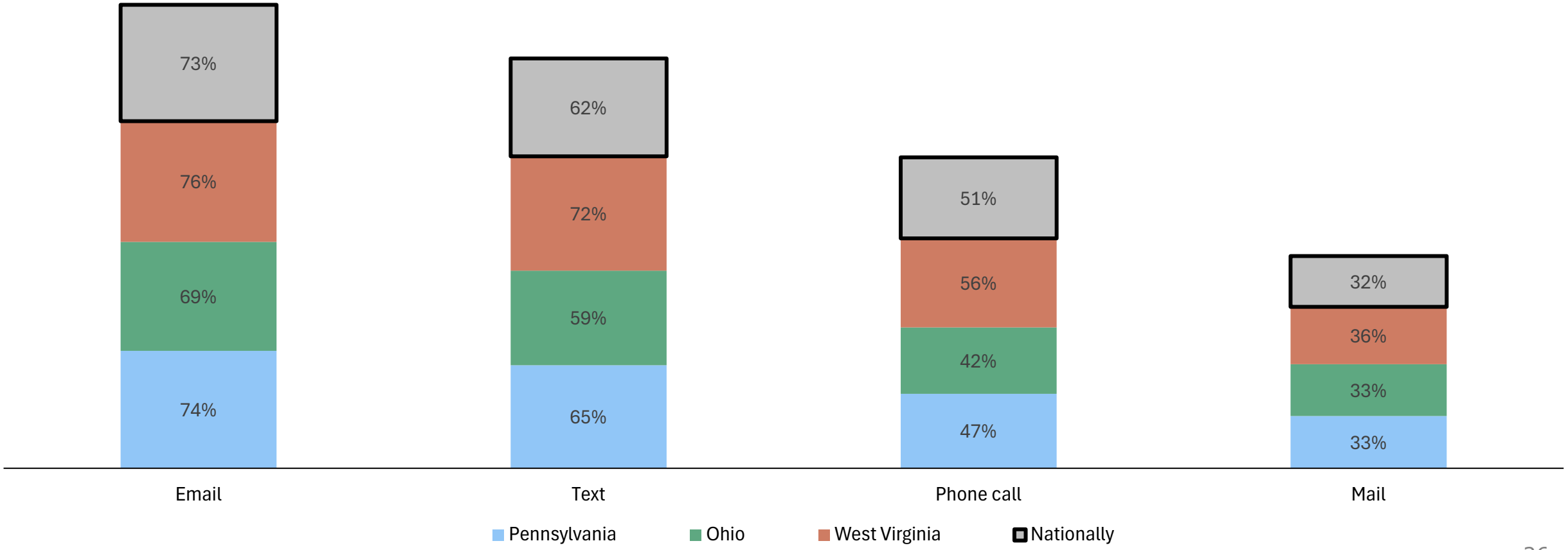
West Virginians agree on the importance of trust and safety for engagement.



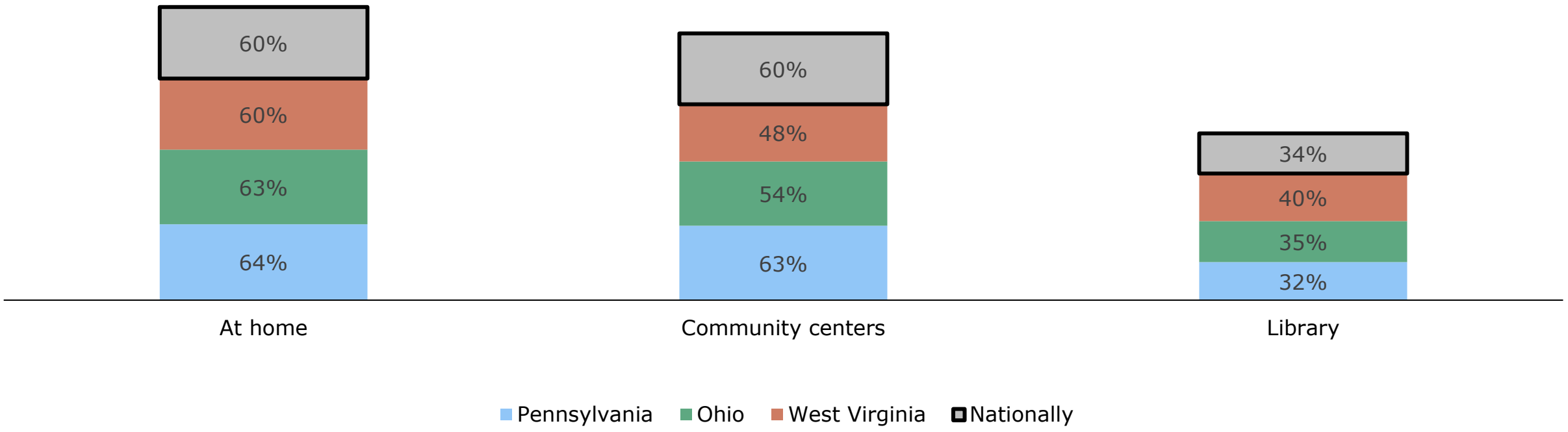
Ohioans say trust and safety will help them engage, consistent with the national average.



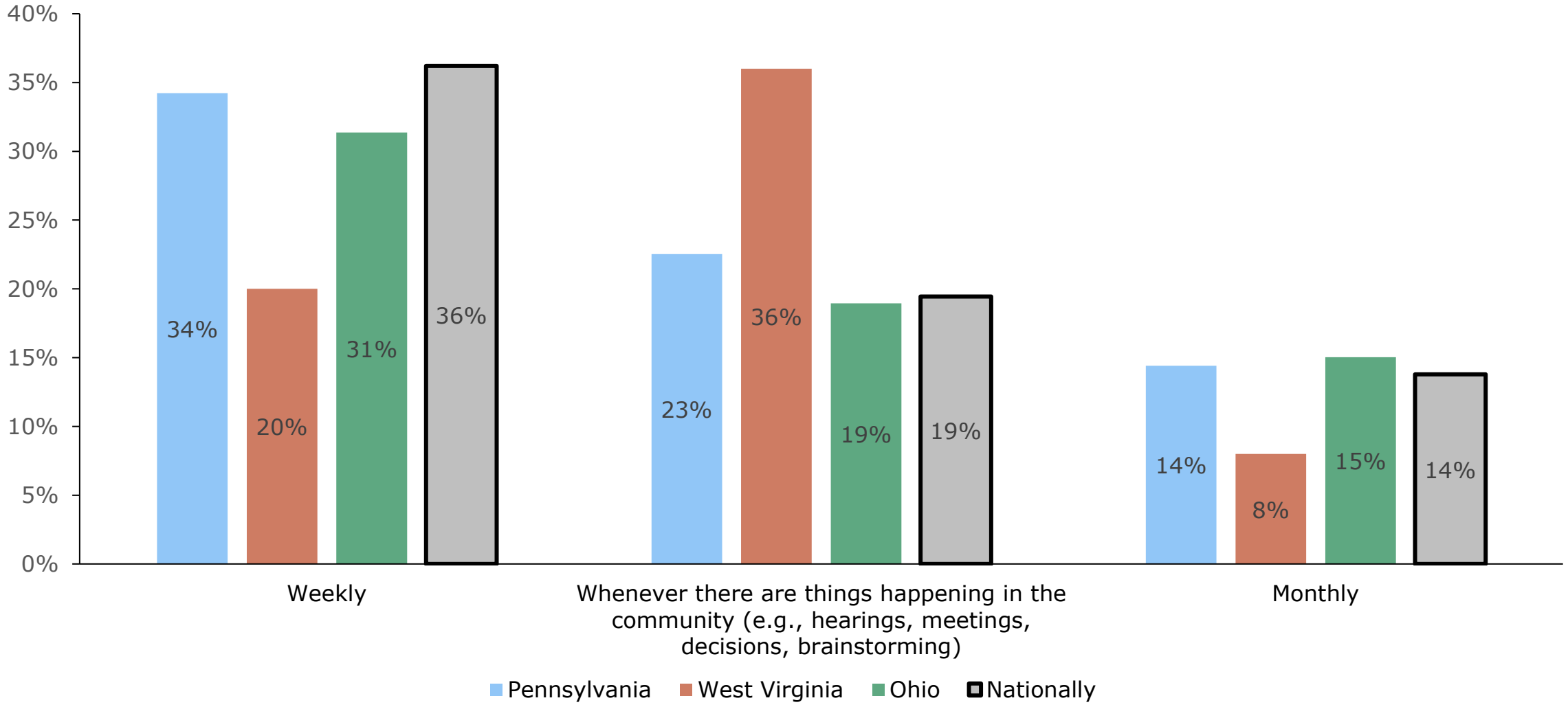
Consistent with the national average, email and text are the preferred ways to be reached.



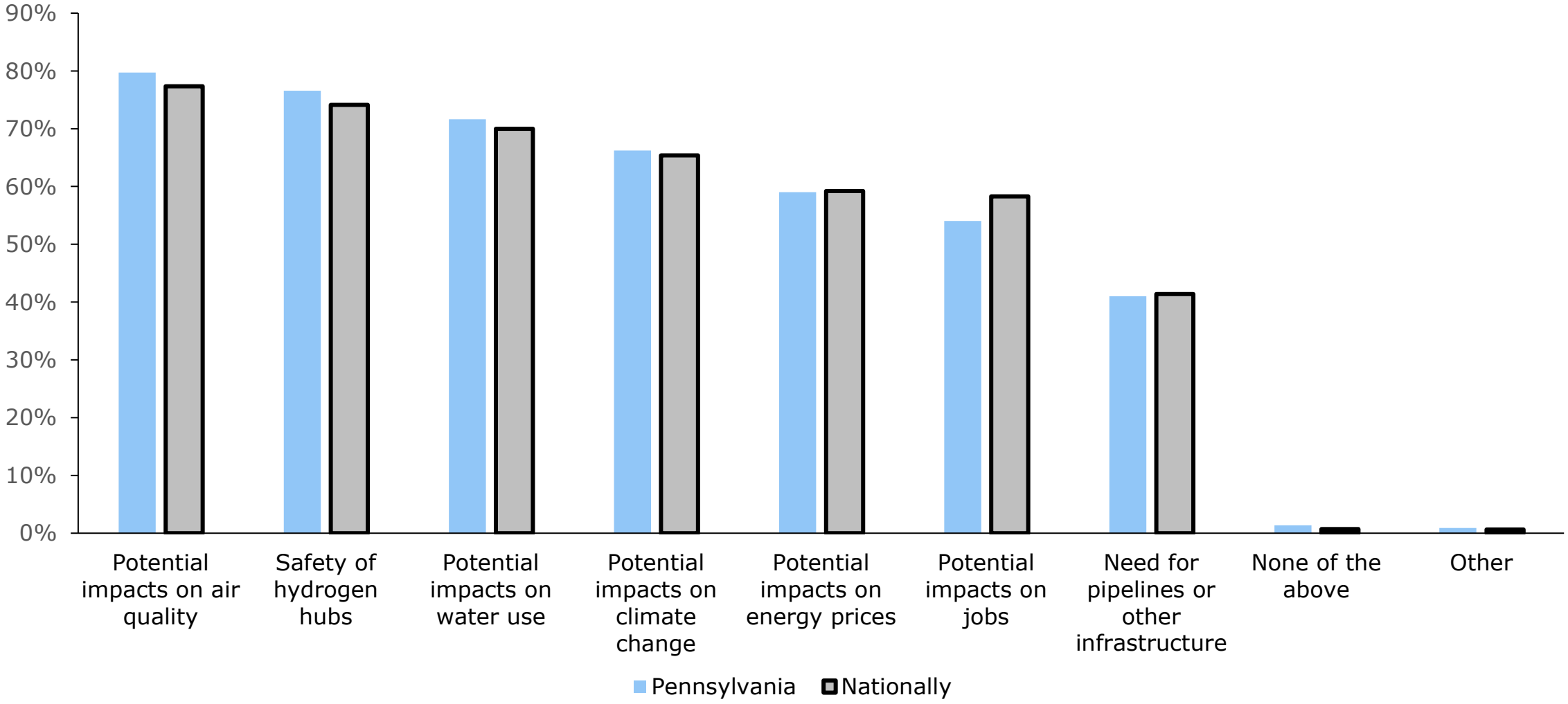
Respondents prefer to be reached at home and in community centers.



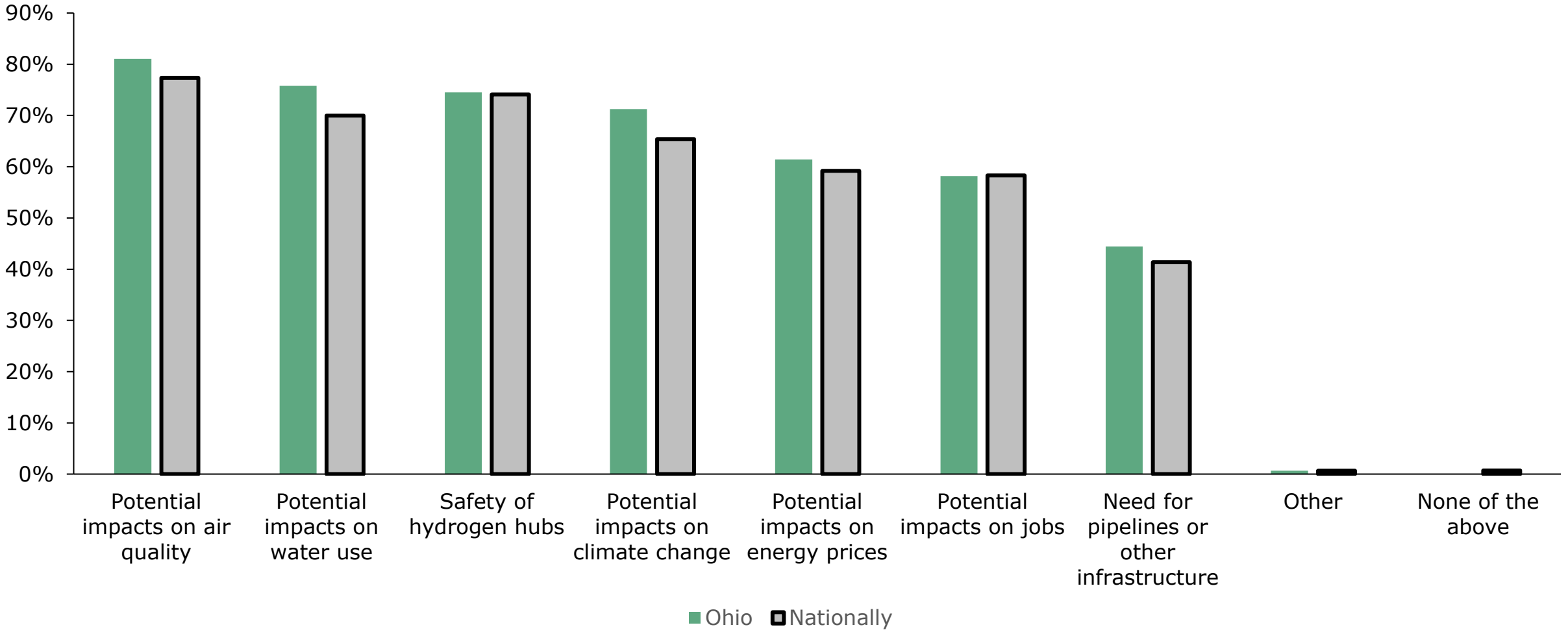
Respondents in West Virginia are more inclined to want updates when things are happening in the community.



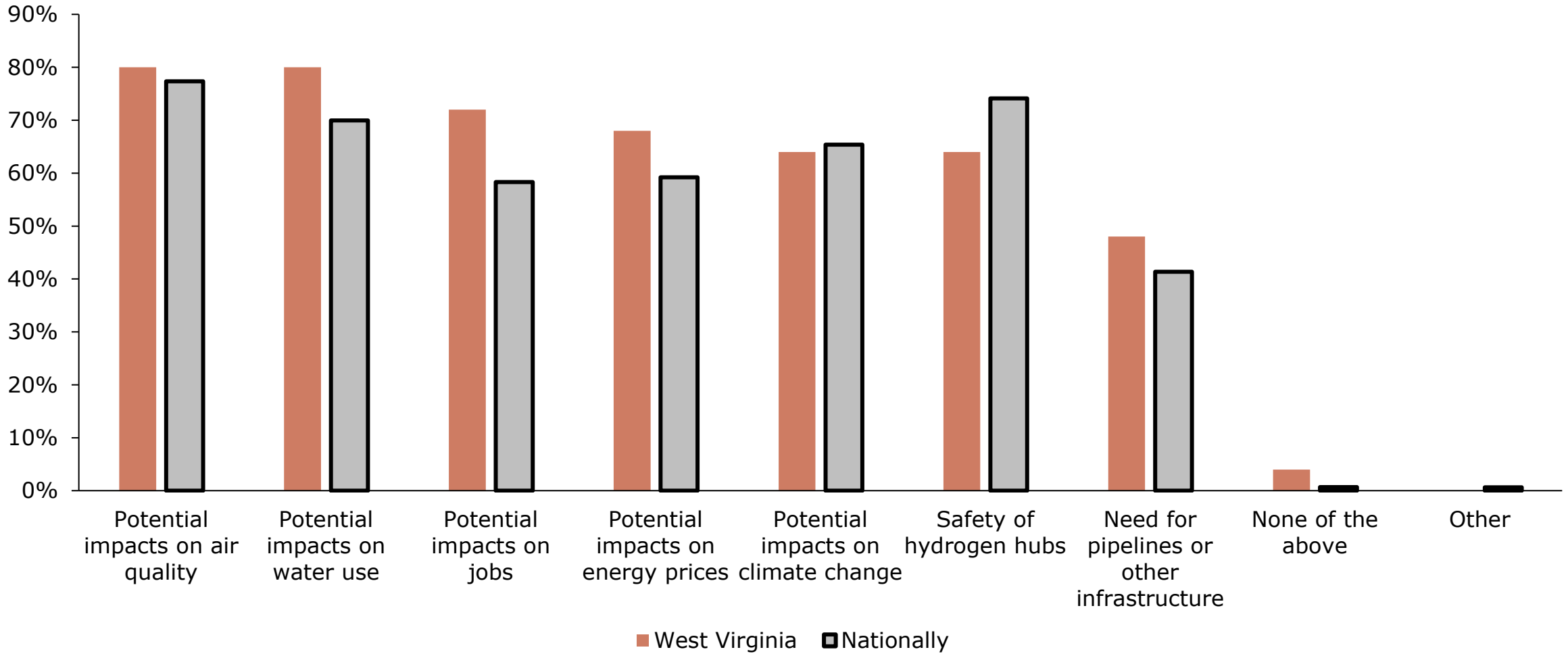
Pennsylvanians' research preferences are aligned with the national average.



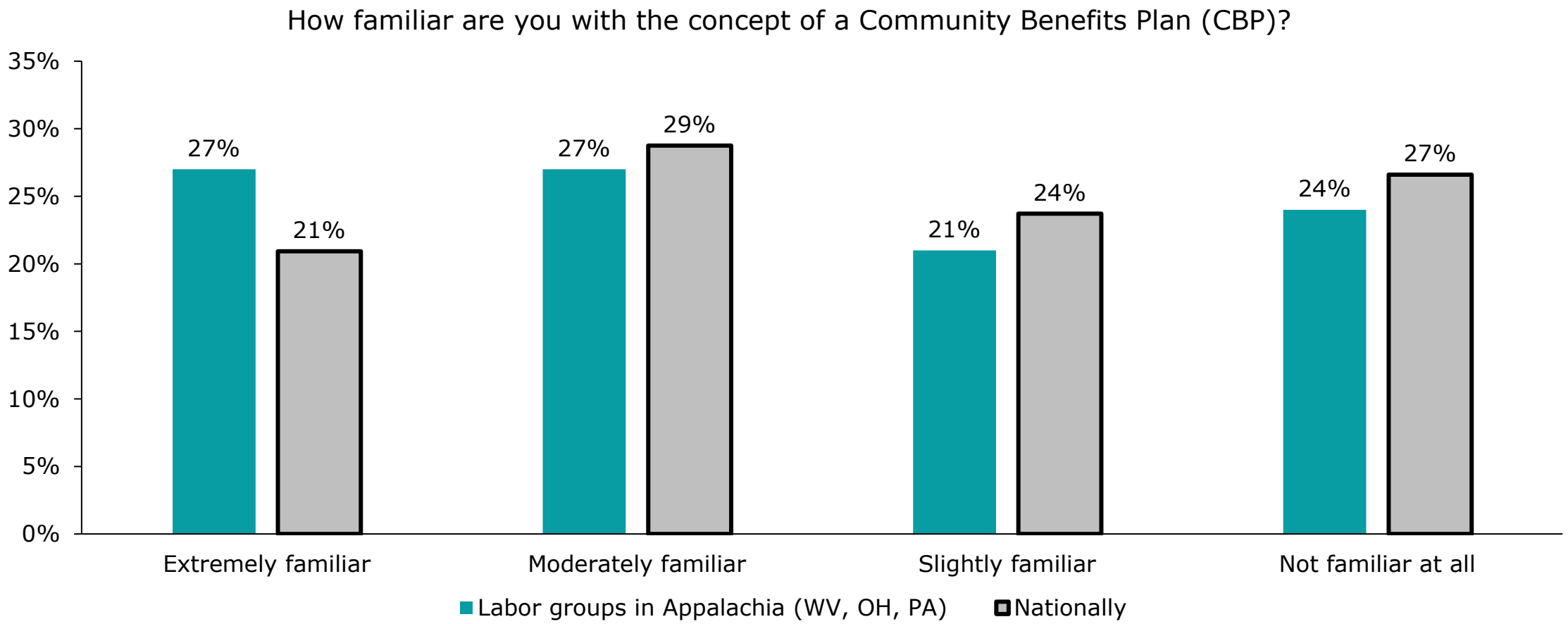
Ohioans' research preferences are aligned with the national average, with a slight preference for information about impacts on water use.



West Virginians are less concerned about safety, and more concerned about air quality, water use, and jobs.

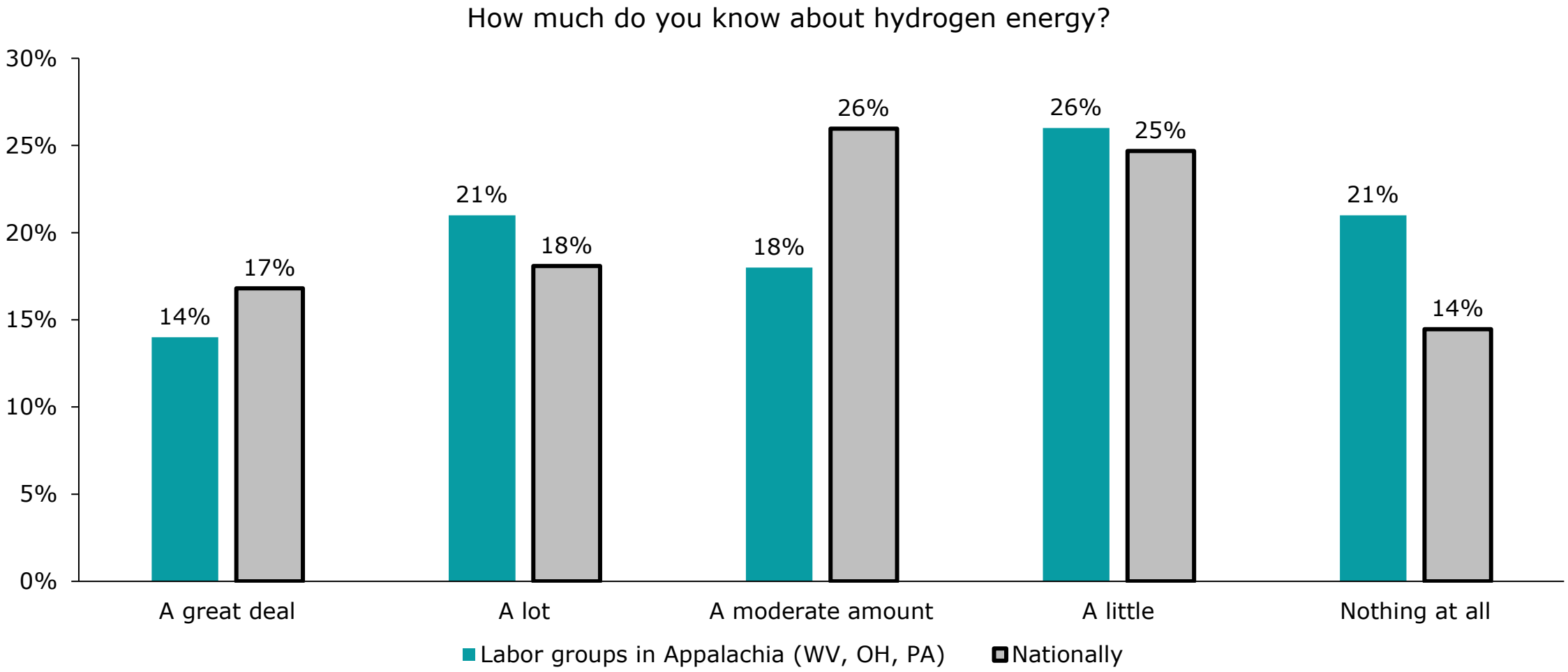


Respondents from labor groups in Appalachia reported being 'extremely familiar' with CBPs, above the national average.



*'Nationally' refers to the national average, which includes respondents from disadvantaged communities, EJ organizations, Tribal Nations, and labor groups.

Respondents from labor groups in Appalachia were generally less familiar with hydrogen compared to the national average.



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